755

EFFECT OF THE LEVEL OF FAT IN THE DIET ON THE GROWTH PERFORMANCE OF DOGS [1]

A. J. SIEDLER AND B. S. SCHWEIGERT

Division of Biochemistry and Nutrition, American Meat Institute Foundation, and

Department of Biochemistry, University of Chicago, Chicago, Illinois

THREE FIGURES

Considerable interest has developed in the use of inedible fats in dry dog foods, particularly when such fats are in excess supply. McCay ('49) has stated that fats are well utilized by dogs; however, to our knowledge, a systematic study of the performance of dogs fed graded levels of fat in addition to a basal diet comprised of crude ingredients commonly used in commercial meals has not been reported. Although 10 to 15% fat is commonly added to purified diets for dogs, only 5 to 7% fat is used in commercial dry meals. In view of these considerations, it was of importance to evaluate the effect of adding fat, stabilized with an anti-oxidant, to practical diets on the growth rate, and food and caloric efficiencies of young dogs.

EXPERIMENTAL

Experiment 1

An experimental (basal) ration was formulated with ingredients commonly used in commercial dry dog meals to

[1] Journal Paper 53, American Meat Institute Foundation.

A report of work done under contract with the U. S. Department of Agriculture and authorized by the Research and Marketing Act. The contract is being supervised by the Eastern Regional Research Laboratory of the Bureau of Agricultural and Industrial Chemistry.

provide adequate amounts of the known growth factors for the dog as outlined by Michaud and Elvehjem ('44). As a further test of the formulated ration, a commercial dry meal was purchased directly from the manufacturer and compared with the experimental ration. The composition of the experimental ration and the proximate analysis of pooled samples of both rations are given in tables 1 and 2.

TABLE 1

COMPOSITION OF EXPERIMENTAL RATION [1]	AMOUNT
	%
Corn flakes	26.75
Wheat flakes	26.70
Soybean grits (HI-PRO-CON)	19.00
Meat and bone scrap	15.00
Fish meal (Menhaden)	3.00
Wheat germ meal (defatted)	5.00
Dried skim milk	2.50
A and D oil (Nopco xx-2250 U.S.P. units A, 400 A.O.A.C. units D/gm)	0.50
Iodized salt	0.25
Brewers' yeast (non debittered)	0.50
Riboflavin supplement (BY-500)	0.80
	100.00

[1] We are indebted to the Schlitz Brewing Co., Milwaukee, Wisconsin, for supplying the yeast, and to the A. E. Staley Manufacturing Co. for supplying some of the soybean grits used in this study.

TABLE 2

Proximate analysis of rations [1]

ANALYSIS	COMMERCIAL RATION	EXPERIMENTAL RATION
	%	%
Moisture	6.1	6.3
Protein (N × 6.25)	25.7	29.1
Fat (ether extract)	5.9	3.7
Ash	6.9	6.7
Fibre	4.9	2.4

[1] Made by the Service Laboratory, American Meat Institute Foundation.

The added fat (choice white grease — a high grade of inedible pork fat) was stabilized by the addition of butylated-hydroxyanisole 0.02%, citric acid 0.01%, and propyl galate 0.005% (Kraybill et al., '49; Dugan et al., '50) to the melted fat at 80°C.

The rations were made up 60 days prior to feeding to approximate the shelf life of commercial meals and to investigate the development of rancidity during storage. Separate studies are being conducted on the effect of different anti-oxidant combinations on the stability of greases added to feeds (Neumer and Dugan, '52).

Registered cocker spaniel pups of mixed sex (average age of 12 weeks) were purchased, treated for intestinal parasites, dipped into a DDT solution for removal of external parasites, injected subcutaneously with anti-canine distemper serum, and individually housed in sterilized metal cages equipped with raised, expanded metal bottoms in a room thermostatically heated to 76°F. The dogs were fed the experimental ration during an initial two-week orientation period during which an infection (controlled through oral administration of antibiotics) occurred among some of the dogs.

At the termination of an additional two-week orientation period, the dogs were arranged into 6 feeding groups as evenly as possible (judged by litter, weight, sex and body conformation) and fed either the experimental ration (three dogs), experimental ration + 6% stabilized fat (three dogs), experimental ration + 6% stabilized fat with the caloric intake per dog restricted to the average caloric intake per dog for the group fed the experimental ration (4 dogs), experimental ration + 13.5% sucrose (sucrose equal in crude calories to 6% fat) (three dogs), commercial dog meal (three dogs), or commercial dog meal + 6% stabilized fat (4 dogs). The fat and sucrose were added at the expense of the entire ration. All dogs except those calorically restricted were fed ad libitum. All rations were fed dry and all groups were given water ad libitum. The group fed sucrose was included to determine if the effect of feeding fat could be attributed to

factors other than calories and to evaluate further any effect of diluting other nutrients (minerals, vitamins, proteins) associated with the addition of fat or sucrose to the rations.

The dogs were fed the rations for a 10-week period and weighed at weekly intervals. Food consumption records were obtained for each dog during the first through 8th week on experiment. The food and caloric efficiencies were calculated from these data.

Experiment 2

A second experiment was performed using female cocker spaniel pups (12 weeks of age) as the test animals. Female dogs were used in order to obtain reproduction and lactation data when they were fed various levels of fat. The results of the reproduction and lactation studies will be available at a later date. The basal ration, the stabilized fat added to the rations, and the treatment and housing of the dogs were identical with those of the first experiment. All rations were freshly mixed before feeding. Four groups of weanling female cocker spaniel pups were used (7 dogs in each group) and fed either the experimental ration, the experimental ration + 4% stabilized fat, the experimental ration + 8% stabilized fat or the experimental ration + 18% sucrose (sucrose equal in crude calories to 8% fat). The dogs were weighed at weekly intervals over a 10-week period. One dog in the group fed 8% added fat and two dogs fed the sucrose diet died during the first two weeks of the experiment from unknown causes. Food consumption records were obtained from the 4th through 7th week of the experiment. All dogs were fed and given water ad libitum and all rations were fed dry.

RESULTS AND DISCUSSION

The dogs fed the basal diet in experiment 1 averaged 371 gm gained per week, while the dogs fed the commercial ration averaged 334 gm gained per week (table 3). No differences in average food and caloric efficiencies were noted between these groups, indicating that the experimental ration used was

equal to, or better than, the commercial ration. The rates of gain and the food and caloric efficiencies of the groups fed 6% fat in addition to either the basal ration or commercial ration were equal to or slightly better than those for

TABLE 3

Effect of feeding different levels of fat on the rate of gain and the food and caloric efficiency of dogs

RATION	NO. OF DOGS	AVE. INITIAL WT.	AVE. GAIN/ WK.	FOOD EFFICIENCY [1]	CALORIC EFFICIENCY [2]
		gm			
Experiment 1					
Commercial ration	3	2,920	334	0.22	6.2
Commercial ration + 6% fat	4	2,490	383	0.24	6.2
Experimental ration	3	3,140	371	0.22	6.1
Experimental ration + 6% fat	3	3,410	443	0.26	6.8
Experimental ration + 6% fat [3]	4	3,150	435	0.24	6.4
Experimental ration + 13.5% sucrose	3	2,990	402	0.22	6.2
Experiment 2					
Experimental ration	7	3,300	339	0.18 ± 0.011 [4]	5.2 ± 0.32 [4]
Experimental ration + 4% fat	7	3,180	360	0.17 ± 0.022	4.5 ± 0.55
Experimental ration + 8% fat	6	3,870	334	0.17 ± 0.026	4.4 ± 0.59
Experimental ration + 18% sucrose	5	3,310	328	0.15 ± 0.011	4.1 ± 0.30

[1] Grams gained per gram food consumed.

[2] Grams gained per 100 crude calories consumed.

[3] Caloric intake restricted to that of the group fed the experimental ration (see text).

[4] Standard error.

the groups fed the rations without added fat (figs. 1 and 2; table 3). The performance of the group fed sucrose was similar to that of the group fed the basal diet. The group fed the experimental ration + 6% fat with the caloric intake restricted to the caloric intake of the group fed the experi-

mental ration did not consume the calories allotted and, therefore, can be considered as having been fed ad libitum. Excellent agreement was found for the average rates of gain, food efficiencies, and caloric efficiencies between the two groups

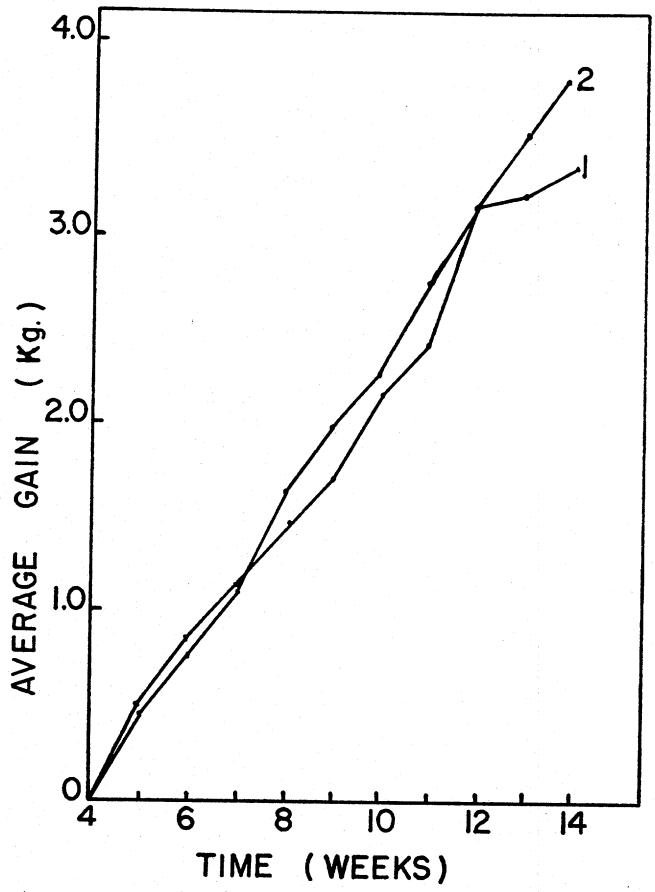

Fig. 1 Average rate of gain of dogs fed the commercial ration (curve 1) or the commercial ration plus 6% fat (curve 2) in experiment 1.

receiving 6% added fat, as is indicated in table 3. Therefore, the rates of gain per week for these two groups are shown as a single curve in figure 2. No differences in general appearance, health, and haircoats were noticed in any of the groups tested.

Organoleptic evaluations of the rations with added fat showed that no detectable rancidity developed during storage for two months at room temperature.

The average gain per week for the various groups used in the second experiment are summarized in figure 3 and the

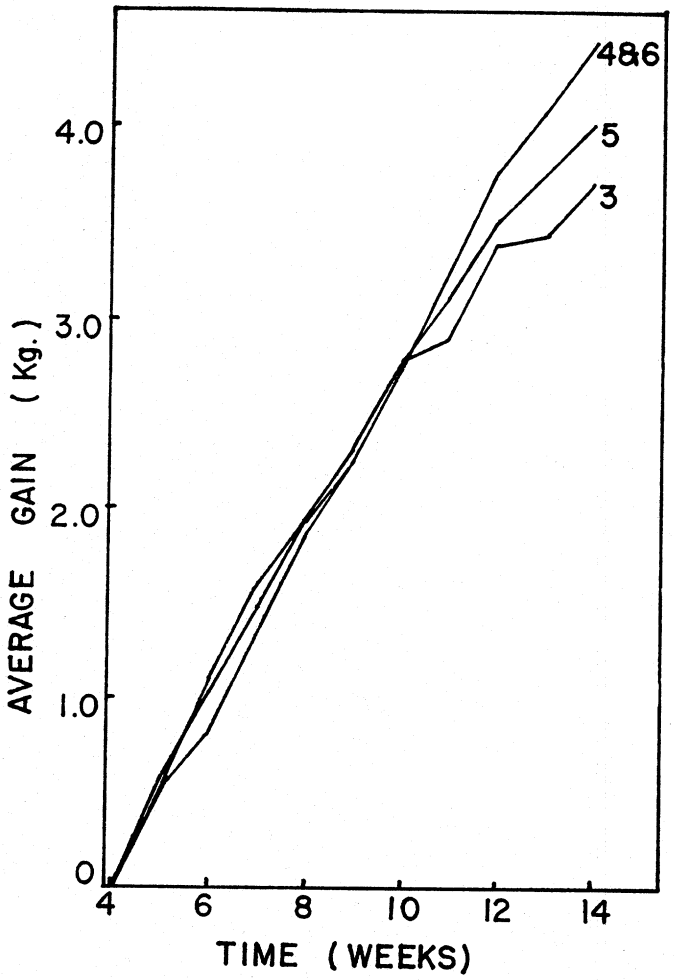

Fig. 2 Average gain per week for dogs fed the basal ration (curve 3) or this ration + 6% fat (composite for calorie-restricted and ad libitum-fed groups, curves 4 and 6 — see text) or the basal ration + 13.5% sucrose (curve 5), experiment 1.

results over a 10-week period for the food and caloric efficiencies are shown in table 3. The results for this experiment confirmed those obtained in the first experiment, in

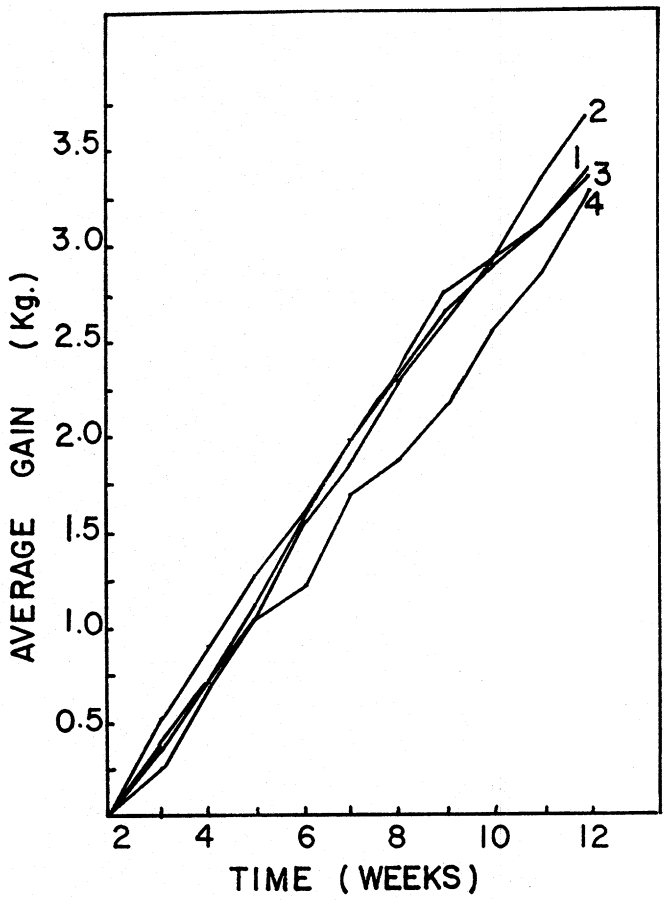

Fig. 3 Average gain for the groups fed the basal diet (curve 1), basal diet + 4% fat (curve 2), basal diet + 8% fat (curve 3), or basal diet + 18% sucrose (curve 4) in the second experiment.

that the average gains per week and the food efficiencies of all the groups tested were quite uniform, although the group receiving 4% added fat showed somewhat higher average gains per week.

Somewhat lower rates of gain were observed in the second experiment than in the first experiment. This variation may have been due to the absence of male dogs and the smaller body conformation of many of the dogs used in this second experiment. The caloric efficiencies for the groups fed added fat or sucrose were somewhat lower than for the basal group in this experiment. Except for the two dogs excluded from the results, the general appearance, haircoat and health of all dogs were excellent.

The results on an over-all basis are in good agreement for the two experiments and indicate that the performance of weanling cocker spaniel pups fed the basal diet plus 4, 6, or 8% fat was equal to or slightly better than that of the dogs fed the basal diets without added fat, based on rates of gain, general appearance, food utilization and the health of the pups.

These results indicate that widening the protein, mineral, and vitamin-to-calorie ratios by the addition of fat did not reduce the rate of gain. Therefore, the protein, mineral and vitamin content of the experimental ration was in excess of the requirements of cocker spaniels during the stage of growth used in these studies.

SUMMARY

The rate of gain of young cocker spaniel pups fed diets comprised of ingredients commonly used in dry meals, with or without added fats (choice, white grease stabilized with antioxidants), was investigated. The rates of gain for a 10-week period, when 4, 6, or 8% fat was added to the basal diet or when 6% fat was added to a commercial meal, were equal or slightly superior to those obtained when the diets without added fat were fed. No significant differences in the food or caloric efficiencies were noted between the groups fed different levels of fat, which indicated that the calories from the fat were well utilized. The performance of groups fed sucrose (equivalent in crude calories to the added fat) was comparable to that of groups fed the basal diet.

It is concluded that 4, 6, or 8% stabilized fat can be successfully added to the experimental ration used in these experiments, as judged by rates of gain, food utilization and the general health of young cocker spaniel pups.

LITERATURE CITED

DUGAN, L. R., H. R. KRAYBILL, L. IRELAND AND F. C. VIBRANS 1950 Butylated hydroxyanisole as an antioxidant for fats and foods made with fat. Food Tech., *4:* 457.

KRAYBILL, H. R., L. R. DUGAN, B. W. BEADLE, F. C. VIBRANS, V. SCHWARTZ AND H. REZABEK 1949 Butylated hydroxyanisole as an antioxidant for animal fats. J. Am. Oil Chem. Soc., *26:* 449.

MCCAY, C. M. 1949 Nutrition of the Dog. Comstock Publishing Company, Inc., Ithaca, New York.

MICHAUD, L., AND C. A. ELVEHJEM 1944 Nutritional requirements of the dog. Nutrition Abstr. and Rev., *13:* 323.

NEUMER, J., AND L. R. DUGAN 1952 Unpublished data.